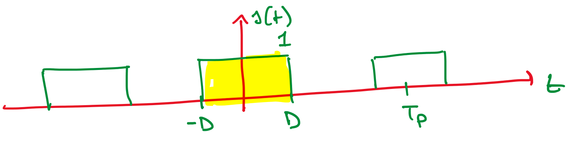
# Le19

Thursday, 23 April 2026 08:30

## ES 1 CALCOLARE $S_K$ PSR




$2D < T_p$

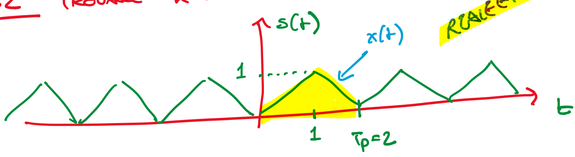
ONDA QUASI DUTYCYCLE $d = \frac{2D}{T_p} < 1$

$s(t) = rep_{T_p} x(t)$ $\quad x(t) = rect\left(\frac{t}{2D}\right)$ $\xrightarrow{FT}$ $X(j\omega) = 2D\, sinc\left(\frac{\omega \cdot 2D}{2\pi}\right)$

$S_K = \frac{1}{T_p} \cdot X(jK\omega_0), \quad \omega_0 = \frac{2\pi}{T_p}$

$= \left(\frac{1}{T_p} \cdot 2D\right) sinc\left(K\omega_0 \frac{2D}{2\pi T_p}\right) = d\, sinc(Kd)$

## ES 2 TROVARE $S_K$ PSR



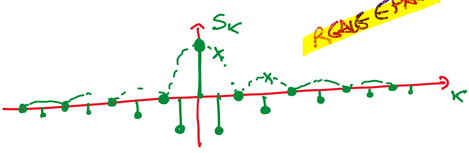

RCALE E PARI

$s(t) = rep_2\, x(t)$ $\quad x(t) = \Lambda(t-1)$ $\xrightarrow{FT}$ $X(j\omega) = sinc^2\left(\frac{\omega}{2\pi}\right) \cdot e^{-j\omega \cdot 1}$

$S_K = \frac{1}{2} X(jK\omega_0), \quad \omega_0 = \frac{2\pi}{2} = \pi$

$= \frac{1}{2} sinc^2\left(\frac{K\omega_0}{2}\right) e^{-jK\omega_0 \pi}$

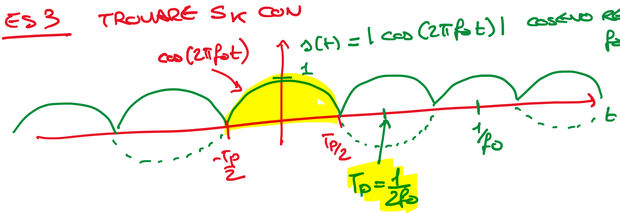
$= \frac{1}{2} sinc^2\left(\frac{K}{2}\right) \cdot \underbrace{e^{-jK\pi}}_{(e^{-j\pi})^K = (-1)^K} = \frac{1}{2} sinc^2\left(\frac{K}{2}\right) \cdot (-1)^K$




RCALE E PARI ✓

$S_0 = \frac{1}{2} sinc^2(0) \cdot e^{j\cdot 0} = \frac{1}{2} = m_s$ ✓

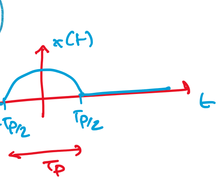
## ES 3 TROVARE $S_K$ CON




$s(t) = rep_{T_p} x(t)$

$S_K = \frac{1}{T_p} X(jK\omega_0), \quad \omega_0 = \frac{2\pi}{T_p}$ $\quad T_p = \frac{1}{2f_0}$

$x(t) = \cos(2\pi f_0 t) \cdot rect\left(\frac{t}{T_p}\right)$




$= \frac{1}{2} e^{j2\pi f_0 t} rect\left(\frac{t}{T_p}\right) + \frac{1}{2} e^{-j2\pi f_0 t} rect\left(\frac{t}{T_p}\right)$

$X(j\omega) = \frac{1}{2} T_p\, sinc\left(\frac{T_p}{2\pi}(\omega - 2\pi f_0)\right) + \frac{1}{2} T_p\, sinc\left(\frac{T_p}{2\pi}(\omega + 2\pi f_0)\right)$

$= \frac{T_p}{2} sinc\left(\frac{T_p}{2\pi}\omega - \frac{T_p 2\pi f_0}{2\pi}\right) + \frac{T_p}{2} sinc\left(\frac{T_p}{2\pi}\omega + \frac{T_p 2\pi f_0}{2\pi}\right)$ (½, ½)

$S_K = \frac{1}{T_p} X(jK\omega_0) \quad \omega_0 = \frac{2\pi}{T_p}$

$= \frac{1}{T_p} \cdot \frac{T_p}{2} sinc\left(\frac{T_p}{2\pi} \cdot K\omega_0 - \frac{1}{2}\right) + \frac{1}{T_p} \cdot \frac{T_p}{2} sinc\left(\frac{T_p}{2\pi} \cdot K\omega_0 + \frac{1}{2}\right)$

$= \frac{1}{2} sinc\left(K - \frac{1}{2}\right) + \frac{1}{2} sinc\left(K + \frac{1}{2}\right)$